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Smart and Healthy within the 2-degree Limit

Sustainable Building Practice and Guidance for Dai Villages, Southwest China

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ABSTRACT: *This paper studies the Dai houses and villages in Xishangbanna, Southwest China. Dai is one of 55 ethnic minorities in China. By comparing the field study of Dai houses carried out in the 1990s and the field study for two villages in 2017, the research investigates two key aspects. Firstly, it considers the influence of new building materials and technologies and impacts brought in by rapid urbanization, together with changes in the traditional integrated relationship between houses, village environment, and surrounding environment. Three key impacts on rural development in the region were identified. Secondly, the project explores the development of the research methods for vernacular houses in China. The focuses of investigation, starting from anthropological studies in the 1950s, now include greater consideration of environmental context. Research found that architects and academic scholars can support the interface between policy, academic studies and practices on rural development for decision-making. Medium term planning is needed in order to provide link between current practice and long term sustainable aims.*

KEYWORDS: *Dai houses, vernacular houses, rural development, village environment, sustainable development*

1. INTRODUCTION

The Dai ethnic group is one of 55 minorities living in Southwest China who has shared cultural elements with other Tai people in Southeast Asian countries. The traditional Dai houses and villages together with surrounding forests and fields formed an integrated ecological system [1]. The systematic studies of Dai houses and culture were first carried out by anthropologists and scholars in other disciplines in the 1950s. Since the 1990s, rapid urbanization in adjacent cities, new materials and associated technologies introduced to the area had great impacts on design and construction of village houses. By comparing the field study of Dai houses carried out in the 1990s and the field study of two villages in 2017 by authors, this paper identifies three important aspects that have significant impacts on sustainable development in the region. Firstly, the transformation of Dai houses that took place in 3 phases, due to the usage of new materials. Secondly, the changing relationship between new houses and existing village environments and the surrounding area. Thirdly, the interaction between individual design and construction activities and external support from government and professionals.

The project also explores the development of the research methods of vernacular houses in the regions. The investigation of vernacular architecture and villages in Southwest China were primarily based on anthropological studies introduced by scholars in the 1930s. Contemporary studies, however, have included more considerations of building design, construction and environmental context. Both research and practices on rural development explore more of material, technology, spatial arrangement, function and tectonic

consideration. New methods indicate that architects and designers can support the interface between policy, academic studies and practices on rural.

2. EVOLUTION OF DAI HOUSES AND VILLAGES

The traditional Dai villages situated in an integrated surrounding environment meant that there was a close link between traditional ways of building and the Dai people's understanding of the relationship between human settlements and natural environment. Throughout history, the shared beliefs and knowledge of construction between builders and householders allowed flexible but coherent changes for Dai houses to occur within an ecological system (see figure 1). Field studies of Dai villages in Xishuangbanna in the 1990s as part of author's PhD study demonstrated changes brought in by new materials and technologies. After new materials such as bricks and concrete were used for construction, the shared knowledge of building between builders and householders changed.

2.1 Changes of Dai houses in three phrases

Since the 1980s, new materials such as bricks began to be used in extensions with the main parts of house remaining as timber. Research shows that spatial arrangement in those houses for different functions and relationship with the environment were maintained with small modifications (Figure 2).

The fundamental transformation came in the 1990's when the buildings started to be built almost entirely from bricks or concrete (see figure 3). The lack of knowledge of new materials or understanding of the associated technology not only led to dangerous structures being built in earthquake areas, but also

created a huge waste burden for the ecological system. New houses, built by non-professionals, required repair, amendment and rebuilding because of the risks related to flooding and earthquakes. The lack of knowledge of new materials and technologies made it difficult for villagers to participate in the decision making process of building their own houses. Very often the decisions were made by based on the cost they could afford and to maximize the size of house on the available site.



Figure 1: Traditional Dai timber house (authors).



Figure 2: Dai house with brick extension (authors).



Figure 3: Dai concrete house (authors).



Figure 4: Village environment (authors).

Case studies of two villages showed that one had kept many traditional styles houses, despite being built between 2008 and 2011. Houses in this village were primarily built by a local carpenter with help from the householders. The second had more concrete houses

and paved village roads (Figure 3). The inter-relationship between houses, buildings, streets, and open spaces (see Figure 4) in these two cases were further analysed.

The outcome of the case study investigations showed that there is fundamental change of operations in the village with new houses, roads and facilities being added. It is concluded that there is a need to gain a much more realistic understanding for the future of how the villages might operate in the new environment.

2.3 Targets linking current practice and long term aims

The transformation brought by new materials and construction, led to top down procedures initiated by the municipal government and planning department aimed to support villagers. This had three key aspects: training builders to have knowledge of brick and concrete construction; identification and classification of dangerous houses; and repair or re-building of houses at risk together with financial support. These are effective methods particularly for families that had financial difficulties, though bottom up process are also an important part of the whole system [2-3].

Guidance documents distributed to construction teams have worked well in the region for promoting good practice and focusing on two aspects. Firstly, an emphasis on good quality construction and structural safety. Secondly guidance for tourist towns and villages to design and build in harmony with the traditional context. In order to develop this further, it is necessary to include a framework of sustainability measures in the guidance books to direct current practice with medium-term targets in order to achieve long term aims. Those include, for example, consideration of orientation, ventilation, lighting, and the relationship between houses and village environment.

3. CONCLUSION

As a result of examining the changes in new village houses and their impacts on the existing village environment, we argue that there is a need to consider systematic changes of academic research, design and construction practices, together with government policy and support for sustainable development in rural areas.

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